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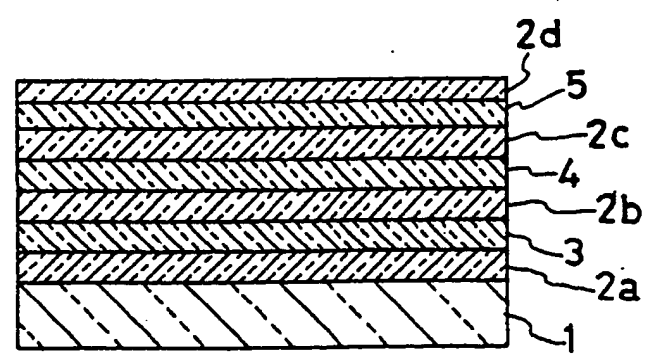
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Optical memory device.

An improved optical memory device comprising a substrate and a plurality of optical memory layers made of a photochromic material and formed over the substrate, the plurality of optical memory layers being laminated to each other through a heat con-

ductive transparent film, which is adaptable for high density and/or high capacity recording of information.

FIG. 1



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## OPTICAL MEMORY DEVICE

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates to an optical memory device, and more particularly to an optical memory device comprising a recording layer made of a material having a photochromic property, and performing recording and reproduction of information by use of light such as laser beam.

#### 2. Description of the Related Art

In recent years, an optical memory device that can record, reproduce and erase information by use of light is an increasing need as a memory device of high density and high capacity. Among the conventional optical memory devices, an optical memory device using a photochromic material for an optical memory layer (a recording layer) has been well known. Particularly known structure of the optical memory device is as shown in Fig.2 which comprises a substrate 11 and a series of optical memory layers  $R_1, R_2 \dots R_n$  formed in this order over the substrate 11, the optical memory layers each being made of a photochromic material and being capable of recording information by use of light of specific wavelengths  $\lambda_1, \lambda_2, \dots \lambda_n$ , respectively, so that the light application of specific wavelengths to respective optical layers provides a multi-recording with  $n$  layers (Japanese Unexamined Patent Publication SHO62-165751 (1987)).

Upon recording information, a laser beam of high energy is applied to the optical memory layers, whereby information is written in the optical memory layers through a chemical change of the structure of photochromic material. Upon reproduction, the information recorded is read out based on the intensity of transmitting light of a laser beam of low energy applied to the optical memory layers.

The conventional optical memory device does however have such a problem that when laser beam is applied to an  $i$ -th layer ( $i \leq n$ ) of the optical memory layers to record information, the temperature of the  $i$ -th layer rises with temperature of adjacent layers [( $i - 1$ )-th and ( $i + 1$ )-th layers] also rising, resulting in that record of information in the ( $i - 1$ )-th or ( $i + 1$ )-th layer vanishes or the optical memory layer (the  $i$ -th layer) itself may be deteriorated.

The invention has been accomplished to overcome the above problem. An object of the invention is to provide an optical memory device which

is less in temperature rise by the irradiation with light upon recording of information, thereby causing no vanish of recorded information and no deterioration of the optical memory layer.

### SUMMARY OF THE INVENTION

According to the present invention, there is provided an optical memory device which comprises a substrate and a plurality of optical memory layers made of a photochromic material and formed over the substrate, the plurality of optical memory layers being laminated to each other through a heat conductive transparent film.

In the optical memory device of the present invention, the heat conductive transparent film dissipates the heat generated in an optical memory layer upon the light application for recording, thereby restraining a rise of temperature of the optical memory layer. Hence, vanish of recorded information in the adjacent optical memory layers or deterioration of the optical memory layer upon the light application for recording can be prevented or notably restrained.

### BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 is an explanatory view showing a structure of an optical memory device prepared by the example of the present invention, and

Fig. 2 is an explanatory view showing a structure of a conventional type of optical memory device.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The substrate used in the present invention is for supporting the optical memory layers and may be formed, for example, with glass, plastics (e.g., polymethyl methacrylate, polycarbonate), ceramics, metal (e.g., aluminum) and the like. Among them, the substrate formed with transparent materials such as glass, plastic and the like is preferable in that it allows the optical memory layers to be irradiated with light from either upper or lower side thereof. Preferable thickness of the substrate is about 0.5 to 2 mm when light is to be applied from the lower(back)side of and through the substrate.

The photochromic material in the present invention is used for forming each optical memory layer over the substrate and may comprises an organic compound that can reversibly change in

it's chemical structure (for example, by tautomerism) by the light irradiation and simultaneously changes it's absorption spectrum. Examples of the organic compound include photochromic compounds of spiropyrane, fulgide, dihydropyran, thioindigo, bipyridine, aziridine, polycyclic aromatic, azobenzene, salicylideneaniline, xanthene, or oxazine. In more detail, such photochromic compounds as disclosed in G.H.Brown, Techniques of Chemistry III, Wiley (1971) may be available. A plurality of photochromic compounds are usually selected as the photochromic materials for forming the optical memory layers being different to each other in absorption wavelength (recording/reproducing wavelength).

The optical memory layer made of the photochromic material may be prepared by the above compounds only or with a mixture of the same and a suitable film-forming material (for example, an organic polymer such as acrylic resin, styrene resin or the like). The optical memory layer may be formed by applying an organic solvent solution of the photochromic compound and the film-forming material, for example, in accordance with spin coating process, and drying the solution layer applied. In this case, it is preferable that an amount of the photochromic compound be 10 to 30 wt% on the basis of the film-forming material. The optical memory layer may be formed by directly depositing the photochromic compound to form a multi-molecular layer in accordance with vacuum deposition or Langmuir-Blodgett's technique. Thickness of the optical memory layer is not specifically limited, but is suitably 0.1 to 50 $\mu$ m, preferably 0.5 to 10 $\mu$ m. The number of the optical memory layers is suitably 2 to 10.

The optical memory layer may contain any coloring agent, dye and the like other than the photochromic material.

The heat conductive transparent film in the present invention is used for dissipating the heat generated in the sensitized portion of the optical memory layer to which the light has been applied, so as to restrain the temperature rise of the optical memory device. The heat conductive transparent films are interposed between a plurality of optical memory layers and require to be higher in heat conductivity than the optical memory layers and also to allow the applied light to sufficiently transmit therethrough. Therefore, the heat conductive transparent film may suitably be thin film made, for example, of a metal nitride or a metal oxide, such as aluminum nitride, silicon nitride, aluminium oxide and the like.

The thin film (the heat conductive transparent film) may be formed selectively, for example, by the CVD process or sputtering process conform-

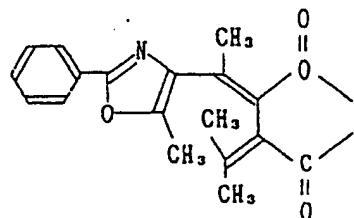
able to kinds of thin films to be formed. It is particularly preferable that the thin film be formed in accordance with a low temperature CVD process performed at a temperature lower than 100°C. Thickness of the thin film is suitably 50 to 350nm, preferably either 60 to 75nm or 330 to 345nm. The heat conductive transparent film may be properly interposed between a plurality of optical memory layers and preferably further disposed on the upper and lower surfaces of the uppermost optical memory layer and the lowest optical memory layer, respectively, to more effectively restrain a temperature rise of the optical memory layers.

In the present invention, a protective film made, for example, of an UV cured resin (hard coated film) may be disposed on the uppermost optical memory layer. Preferable examples of the UV cured resin are of urethaneacrylate or epoxycacrylate type and a suitable thickness thereof is about 10 to 50  $\mu$ m.

#### EXAMPLE

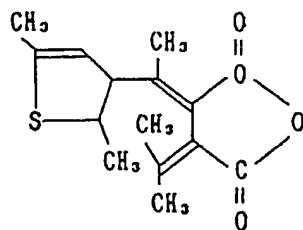
Next, an example of a practical embodiment of the present invention will be detailed with referring to the attached drawings.

First, an aluminium nitride film 2a of thickness 0.33 $\mu$ m (Heat conductivity: about 20J/m.s.K, Transparent) was formed, as shown in Fig.1, on a glass substrate 1 of diameter 130mm and thickness 1.2mm in accordance with the CVD process. Then, on the aluminium nitride film 2a was formed in accordance with the spin coating process (Solvent: Methyl ethyl ketone) an optical memory layer 3 (about 0.7 $\mu$ m in thickness) made of polymethylmethacrylate containing 20 wt% of oxazole derivative substituted heterofulgido compound represented by the following formula, which is sensitive to light of wavelength of 462 nm.

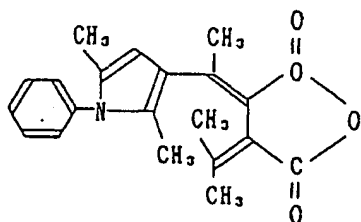


On the optical memory layer 3 was formed a second aluminium nitride film 2b of thickness 0.33 $\mu$ m, and on which was similarly formed in accordance with the spin coating process an optical memory layer 4 (about 0.7 $\mu$ m in thickness) which is sensitive to light of wavelength 523 nm and made of polymethylmethacrylate containing 20 wt% of thiophen derivativ substituted heteroful-

gido compound represented by the following formula.



On the optical memory layer 4 was formed a third aluminium nitride film 2c of thickness 0.33 $\mu$ m, and on which was similarly formed in accordance with the spin coating process an optical memory layer 5 (about 0.7 $\mu$ m in thickness) which is sensitive to light of wavelength 614nm and made of polymethylmethacrylate containing 20 wt% of pyrrole derivative substituted heterofulgido compound represented by the following formula.



Lastly, a fourth aluminium nitride film 2d of thickness 0.33 $\mu$ m was formed on the optical memory layer 5 to produce an optical memory device of the claimed invention (Fig.1).

According to recording test by applying light of specific wavelengths 462nm, 523nm and 614nm from the substrate side of the memory device, the optical memory device was confirmed not to cause any vanish of recorded information or deterioration of the optical memory layers due to less temperature rise of the layer, thereby providing an improved stability in recording of information.

The invention being thus described it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the scope of the invention.

There are described above novel features which the skilled man will appreciate give rise to advantages. These are each independent aspects of the invention to be covered by the present application, irrespective of whether or not they are included within the scope of the following claims.

#### Claims

1. An optical memory device which comprises a substrate and a plurality of optical memory layers made of a photochromic material and formed over the substrate, the plurality of optical memory layers being laminated to each other through a heat conductive transparent film.
2. The optical memory device of Claim 1 in which the heat conductive transparent film is made of a metal nitride or oxide.
3. The optical memory device of Claim 1 in which the heat conductive transparent film is made of aluminium nitride, silicon nitride or aluminium oxide.
4. The optical memory device of Claim 1 in which the heat conductive transparent film has a thickness of 50 to 350 nm.
5. The optical memory device of Claim 1 in which the heat conductive transparent film has a thickness of either 60 to 75 nm or 330 to 345 nm.
6. The optical memory device of Claim 1 in which the heat conductive transparent film is of a deposited layer by a low temperature CVD process performed at a temperature lower than 100° C.
7. The optical memory device of Claim 1 in which the photochromic material is selected from the photochromic compounds of spiropyrane, fulgide, dihydropyrane, thioindigo, bipyridine, aziridine, polycyclic aromatic, azobenzene, salicylideneaniline, xanthene or oxazine.
8. The optical memory device of Claim 1 in which the optical memory layer comprises a mixture of the photochromic material and a film-forming material.
9. The optical memory device of Claim 1 in which the optical memory layer has a thickness of 0.1 $\mu$ m to 50 $\mu$ m.
10. The optical memory device of Claim 1 in which the substrate is made of a transparent material such as glass or plastics.
11. The optical memory device of Claim 1 in which the substrate has a thickness of 0.5 to 2 mm.
12. The optical memory device of Claim 1 which has a protective film on the uppermost optical memory layer.
13. An optical memory device comprising a plurality of optical memory layers characterised in that a transparent material is disposed between a pair of neighbouring memory layers, the transparent material having a heat conductivity greater than the heat conductivity of the optical memory layers.
14. An optical memory device comprising a plurality of optical memory layers characterised in that a transparent layer is disposed between each pair of adjacent optical memory layers, each transparent layer having a heat conductivity greater than the heat conductivity of adjacent optical memory layers.
15. An optical memory device according to claim

14 wherein a further heat conductive transparent layer is disposed on each of the outermost of the optical memory layers.

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FIG. 1

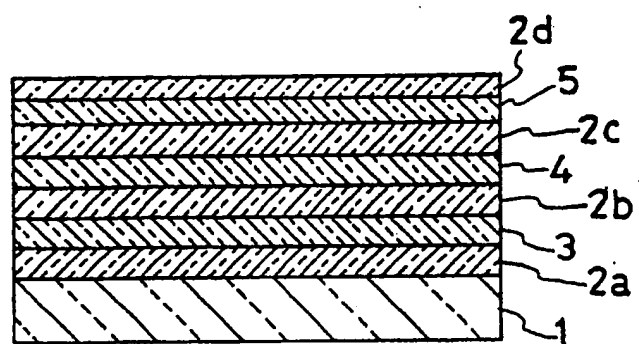
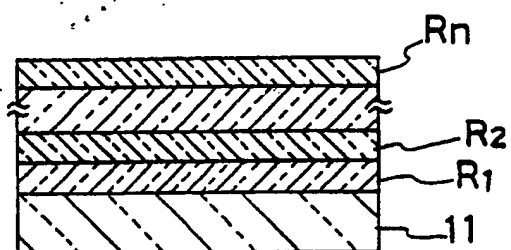


FIG. 2



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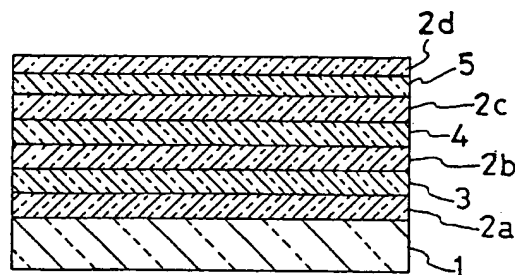
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(54) **Optical memory device.**

(57) An improved optical memory device comprising a substrate and a plurality of optical memory layers made of a photochromic material and formed over the substrate, the plurality of optical memory layers being laminated to each other through a heat conductive transparent film, which is adaptable for high density and/or high capacity recording of information.

FIG. 1



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## EUROPEAN SEARCH REPORT

Application Number

EP 90 31 1890

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	PATENT ABSTRACTS OF JAPAN vol. 13, no. 428 (P-936)(3776) 25 September 1989 & JP-A-1 159 839 ( FUJI ELECTRIC CO )	1-3,7,12	G 11 B 7/24
A	---	13-15	
Y	PATENT ABSTRACTS OF JAPAN vol. 13, no. 140 (M-810)(3488) 6 April 1989 & JP-A-63 306 090 ( MITSUBISHI ELECTRIC CORP )	1-3,7,12	
A	---	13-15	
A	EP-A-0 128 616 (OPTICAL STORAGE INTERNATIONAL & N V PHILIPS) * abstract * * page 5, line 9 - line 13 * * page 6, line 18 - page 7, line 6; claims 1,2; figure 1 **	1-3,10, 13-15	
A	---		
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 45 (M-792)(3393) 2 February 1989 & JP-A-63 252 790 ( CANON INC ) * abstract **	1,2,10	
A	---		
A	EP-A-0 312 339 (MITSUI PETROCHEMICAL INDUSTRIES) * claims 1-8 **	7	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	---		G 11 B
A	PATENT ABSTRACTS OF JAPAN vol. 5, no. 64 (P-59)(736) 30 April 1981 & JP-A-56 016 948 ( NIPPON DENSHIN DENWA KOSHA ) * abstract **	7	
P,X	---		
P,X	JP-A-2 105 346 (FUJI ELECTRIC CO) & PATENT ABSTRACTS OF JAPAN vol. 14, no. 321 (P-1074)(4264) 10 July 1990 * abstract * & WORLD PATENTS INDEX LATEST Section EI, Week 9021, Derwent Publications Ltd., London, GB; Class T, AN 90-161595 * * abstract **	1-3	
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The present search report has been drawn up for all claims			
Place of search		Date of completion of search	Examiner
The Hague		18 February 92	ANNIBAL P.S.
<b>CATEGORY OF CITED DOCUMENTS</b> X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document			





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Patent Office

## EUROPEAN SEARCH REPORT

Application Number

EP 90 31 1890

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
P,X	JP-A-2 230 528 (TOPPAN PRINTING CO) & PATENT ABSTRACTS OF JAPAN vol. 14, no. 542 (P-1137)(4485) 30 November 1990 * abstract *  - - - - -	1-3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
The present search report has been drawn up for all claims			
Place of search  The Hague		Date of completion of search  18 February 92	Examiner  ANNIBAL P.S.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention		E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	



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No. 33139/45.

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Index at acceptance:—Class 2(iii), R18c(3: 4: 6: 7: 8: 9: 14: 15), R18(t1: t2).

## PROVISIONAL SPECIFICATION

## Printed Sheet Materials

We, WILLIAM ELLIOTT FREW GATES, of 38, Attimore Road, Welwyn Garden City, in the County of Hertford, a British Subject, and IMPERIAL CHEMICAL INDUSTRIES LIMITED, of Imperial Chemical House, Millbank, London, S.W.1, a British Company, do hereby declare the nature of this invention to be as follows:—

This invention relates to the production of printed sheet materials which contain polythene, the normally solid polymers of ethylene, as their major ingredients.

Sheets of materials which consist of, or are based on, polythene are of utility because of their extremely low moisture permeability, because of their resistance to attack by chemical reagents and solvents and because of their excellence as electrical insulators. Sheets of these materials have been found, however, to be difficult to print.

According to the present invention we have now found that satisfactory printed sheets of materials which contain polythene as their major ingredient may be obtained by printing with printing mixtures of dyes and/or pigments, and materials which are capable of forming solid solutions with polythene when the materials of the sheets are molten and supported by a backing, said printing mixtures having softening points less than the temperature of the molten material of the sheet.

Materials which are capable of forming solid solutions with polythene include polystyrene; hydrogenated polystyrene; polythene; waxes obtained by the pyrolysis of polythene; chlorinated polythene; polyisobutylene; rubber, cyclised rubber; synthetic rubbers as "Neoprene, G.R.S." and butyl rubber; gutta percha; gum elemi; ester gum; hydrogenated ester gum; hydrogenated oils, such as hydrogenated castor oil; waxes such as paraffin or micro-crystalline wax or ozokerites, carnauba, ceresin, montana, Halowax (Registered Trade Mark) or bees wax; chlorinated naphthalenes and diphenyls;

asphalts; polypropylene; polypropylene sebacate and polyvinyl isobutyl ether. The preferred dyes for use in the process of this invention are wax soluble dyes such as "Waxoline" (Registered Trade Mark) dyes. Dyes and/or pigments may be mixed into the printing mixtures by grinding or preferably, malaxating. Many of these printing mixtures are and may be applied to printing plates or rollers by pressing them on at normal temperatures. Others should be softened by heat or a solvent for polythene such as liquid hydrocarbons or chlorinated hydrocarbon, for ease of application to printing plates or rollers.

A sheet of material to be printed by the process of this invention may be supported on a backing consisting of a fibrous material, such as paper or fabric, the sheet of material printed forming a strongly adherent coating on the fibrous material. Alternatively the sheet of material to be printed may be supported on a polished metal surface so that it may be stripped from the surface when cooled to the solid state. Such polished metal surfaces may form the surface of a roller or a continuous band if continuous operation is proposed. These polished metal surfaces may be coated, if desired, with a separating aid, such as a high melting point grease; aluminium or zinc stearate; or a glazing material such as sodium silicate or a detergent of the type sold under the name "Vulcastab C" (Registered Trade Mark) or "Lissapol C" (Registered Trade Mark).

It is preferred that the means for applying the printing materials of this invention to the sheets to be printed should be cooled so as to chill the sheets printed from the molten to the solid state. This results in a sharp impression of the design printed onto the sheet and rapid chilling improves the gloss of the surface of the sheet.

The sheets of material may be in the molten state immediately after, or during

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formation or may be heated to the molten state prior to printing. Thus sheets of polythene forced as coatings on sheets of fibrous material by the process of British Application No. 25682/45 may be printed by applying the printing mixtures of this invention to the coatings before they have cooled from the molten state, the sheet of fibrous material forming the backing of this invention. Also sheets formed by the process of British Specification 567,358 may be printed during their formation, one or both of the cold surfaces used for chilling the polymer rapidly being used as a means for applying the printing mixtures, one or both of these surfaces being used as the backing. Alternatively, prior to printing, sheets of materials which contain polythene as their major ingredient may be heated to the molten

state by such means as hot rollers or infra heating units when the sheets are backed, e.g., by fibrous materials to which they will adhere tenaciously after cooling or by the polished metal surfaces of rollers or continuous bands from which they may be stripped after cooling. Heating sheets of material which contain polythene as their major ingredient to the molten state has the advantage that any pin-holes which may be present in these sheets after their formation will tend to disappear. However, if the sheets prior to heating contain molecules oriented in a particular direction, the sheets will shrink on themselves in the line of orientation when melted.

Dated the 7th day of December, 1945.

E. A. BINGEN,  
Solicitor for the Applicants.

## COMPLETE SPECIFICATION

### Printed Sheet Materials

We, WILLIAM ELLIOTT FREW GATES, of 38, Attimore Road, Welwyn Garden City, in the County of Hertford, a British Subject, and IMPERIAL CHEMICAL INDUSTRIES LIMITED, of Imperial Chemical House, London, S.W.1, a British Company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the production of printed sheet materials which contain polythene, the normally solid polymers of ethylene, as their major ingredients.

Sheets of materials which consist of, or are based on, polythene are of utility because of their extremely low moisture permeability, their resistance to attack chemical reagents and solvents and their excellence as electrical insulators. Sheets of these materials have been found, however, to be difficult to print.

According to the present invention we have now found that satisfactory printed sheet of a material which contains polythene as its major ingredient may be obtained by a process which comprises printing a sheet of said material while it is molten and supported by a backing with a printing mixture of one or more dyes and/or pigments and a material which is capable of forming a solid solution with polythene, said printing mixture having a softening temperature which is a lower than the temperature of the molten material of said sheet.

It is preferred that the sheet be cooled rapidly from the molten state to the solid state immediately after printing, since

this results in the formation of a sharp impression of the design printed on to the sheet and an improvement in the gloss of the surface of the sheet. This cooling step is preferably carried out by cooling the means for applying the printing mixtures to the molten sheet. For example the printing mixture is conveniently applied by means of a printing plate or roller, and these may also serve to chill the sheet from the molten to the solid state.

Materials which are capable of forming solid solutions with polythene include polystyrene; hydrogenated polystyrene; polythene; waxes obtained by the pyrolysis of polythene; chlorinated polythene; polyisobutylene; rubber; cyclised rubber; synthetic rubbers such as "Neoprene", "G.R.S." and butyl rubber; gutta percha; gum elemi; ester gum; hydrogenated ester gum; hydrogenated oils such as hydrogenated castor oil; waxes such as paraffin or micro-crystalline wax or ozokerites, carnauba, ceresin, montana, Halowax (Registered Trade Mark) or bees wax; chlorinated naphthalenes and diphenyls; asphalts; polypropylene; polypropylene sebacate and polyvinyl isobutyl ether. The preferred dyes for use in the process of this invention are wax soluble dyes such as "Waxoline" (Registered Trade Mark) dyes. Dyes and/or pigments may be mixed into the printing mixtures by grinding or preferably by malaxating. Many of these printing mixtures may be applied to printing plates or rollers by pressing them on at normal temperature. Others should be softened by heat or a solvent for polythene, such as a liquid

hydrocarbon or chlorinated hydrocarbon, for ease of application to printing plates or rollers.

The sheet of material to be printed by the process of this invention may be supported on a polished metal surface so that it may be stripped from the surface when cooled to the solid state. Such polished metal surfaces may form the surface of a roller or a continuous band if continuous operation is proposed. These polished metal surfaces may be coated, if desired with a separating aid, such as a high melting point grease; aluminium or zinc stearate; or a glazing material such as sodium silicate or a detergent of the type sold under the name "Vulcastab C" or "Lissapol C" (Registered Trade Marks). Alternatively, the sheet of material to be printed may be supported on a backing consisting of a fibrous material, such as paper or fabric, the sheet of material printed forming a strongly adherent coating on the fibrous material.

The sheets of material may be in the molten state immediately after or during formation, or may be heated to the molten state prior to printing. Thus sheets of polythene formed as coatings on sheets of fibrous material by the process of British Application No. 25682/45 (Serial No. 600,687) may be printed by applying the printing mixtures of this invention to the coatings before they have cooled from the molten state, the sheet of fibrous material forming the backing which supports the molten sheet. Also sheets formed by the process of British Specification 567,358 may be printed during their formation, one or both of the cold surfaces used for chilling the polymer rapidly being used as a means for applying the printing mixtures, and one or both of these surfaces being used as the backing. Alternatively, sheets of materials which contain polythene as their major ingredient may be heated to the molten state before printing by such means as hot rollers or infra red heating units, while the sheets are supported by a backing, for example, by fibrous materials to which they will adhere tenaciously after cooling, or by the polished metal surfaces of rollers or continuous bands from which they may be stripped after cooling. Heating sheets of material which contain polythene as their major ingredient to the molten state has the advantage that any pin-holes which may be present in these sheets after their formation will tend to disappear. However, if the sheets prior to heating contain molecules oriented in a particular direction, the sheet will shrink on themselves in the line of orientation when melted.

Our invention is illustrated but in no way limited by the following example, in which all parts given are by weight.

#### EXAMPLE.

A mixture containing 20 parts of "Alkathene" (Registered Trade Mark) Grade 700, 10 parts of ester gum, 15 parts of polyisobutylene (molecular weight 8000), 5 parts of microcrystalline wax (melting point 140—145° F.) and 1.5 parts of "Waxoline" (Registered Trade Mark) Yellow dye 1.5, was heated until it was molten and was then stirred with 100 parts of xylene to form a homogeneous paste. This paste was used to ink a roller made from "Welvic" (Registered Trade Mark) which bore a printing design in relief on its surface. This roller rotated in contact with a cold steel roller on to the surface of which the inked design was transferred. The steel roller further contacted the "Alkathene" surface of a sheet of "Alkathene" coated paper while the coating was still molten, and thus printed and chilled the "Alkathene" coating simultaneously. This process resulted in the formation of a sharp impression of the design of the "Welvic" roller on the surface of the coated sheet material.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A process for the production of printed sheet of a material which contains polythene as its major ingredient which comprises printing a sheet of said material while it is molten and supported by a backing with a printing mixture of one or more dyes and/or pigments and a material which is capable of forming a solid solution with polythene, said printing mixture having a softening temperature which is lower than the temperature of the molten material of said sheet.

2. A process according to claim 1 in which said sheet is cooled rapidly from the molten to the solid state immediately after printing.

3. A process according to claim 2 in which said sheet is cooled by cooling the means for applying said printing mixture to said sheet, for example a printing plate or roller.

4. A process according to any of the preceding claims in which said dyes are wax-soluble dyes.

5. A process according to any of the preceding claims in which said sheet is supported while it is molten by a polished metal surface, for example, the surface of a metal roller or endless metal band, and

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is stripped from said surface when it has cooled to the solid state.

6. A process according to any of claims 1 to 4 in which said sheet is supported by a backing consisting of a fibrous material, such as paper or fabric, said sheet forming a strongly adherent coating on the fibrous material when it is cooled to the solid state.

- 10 7. A process for the production of printed sheet of a material which contains

polythene as its major ingredient substantially as hereinbefore described with reference to the foregoing example.

8. Printed sheets, including coatings 15 on sheets of fibrous materials, of materials containing polythene as their major ingredients whenever produced by the process of any of the preceding claims.

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